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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

(Board of Patent Appeals and Interferences)

APPELLANTS:	Vivek R. Pradham et al.	)	PATENT APPLICATION
APPLICATION NO.:	09/918,984	)	Group Art Unit: 1764
FILED:	July 31, 2001	)	Examiner: Walter D. Griffen
FOR:	Multistage Process for Removal of Sulfur from Components for Blending of Transportation Fuels	)	Attorney Docket No.: 37,318-01

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Appeal Brief

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This is an appeal from the final rejection dated March 21, 2003 of claims 1-24. A correct copy of the appealed claims is attached to this brief as Appendix A.

Real Party in Interest

The instant patent application has been assigned to BP Corporation North America Inc.

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Related Appeals and Interferences

Appellants have filed an appeal on June 3, 2003 from a final office action in patent application serial number 09/918,984.

Status of Claims

Claims 1-24 remain pending and have been finally rejected by the Examiner. Claims 1, 11 and 19 are independent claims. Claims 1-10 depend upon Claim 1. Claims 12-18 depend upon claim 11. Claims 20-24 depend upon claim 19.

Status of Amendments

No outstanding amendments that have been filed subsequent to final rejection of claims 1-24.

Summary of Invention

Referring to the specification at page 9, lines 3-18 and claim 1, the subject matter set forth in the instant application and regarded by Appellant as the invention is a method of for the production of products which are liquid at ambient conditions and contain organic sulfur compounds of higher molecular weight than corresponding sulfur-containing compounds in the feedstock, which process comprises the steps of: (1) passing a feedstock through a bed of solid adsorbent, producing an effluent with reduced nitrogen; (2) contacting the effluent at elevated temperatures with an acidic catalyst to convert sulfur impurities in the effluent to a higher molecular weight through an alkylation process, producing an initial product stream; and (3) contacting at least a portion of the initial product stream at temperatures at least 10° C lower than an average of the elevated temperatures in the first contacting stage with an acidic catalyst to convert sulfur impurities in the initial product stream to a higher molecular weight through an alkylation process, thereby forming a subsequent product stream.

Issues

The issues on appeal are whether claims 17 and 18 have been properly rejected under *35 U.S.C. § 112* for lacking proper antecedent basis, and whether 1-24 have been properly rejected under *35 U.S.C. § 103* as being unpatentable over *Alexander* (6,024,865) in view of *Alexander* (6,059,962).

Grouping of Claims

The claims do not stand or fall together.

Summary of the Arguments

The Examiner improperly rejected claims 17 & 18 under 35 U.S.C. § 112, second paragraph, as having insufficient antecedent basis for the limitation "high-boiling." Appellants amended claims 17 and 18 in a document dated February 18, 2003 to have claims 17 and 18 depend from claim 11, which provides the necessary antecedent basis for the limitation "high-boiling."

The Examiner failed to establish a prima facie case of obviousness against claims 1-24 because the cited references do not teach, suggest or motivate one of ordinary skill in the art to make Appellants' claimed invention. More particularly, the cited references do not teach or suggest: (1) subjecting an alkylation product from an initial alkylation stage to a subsequent alkylation stage at temperatures at least 10° C. lower than the average of the elevated temperatures in the first alkylation stage, as recited in claims 1-24; (2) an acidic catalyst of a subsequent contacting stage comprising a material which is prepared from an acidic catalyst by use in a first contacting stage, and a solid adsorbent comprising of a material which is prepared from the acidic catalyst by use in the first contacting stage and/or the subsequent contacting stage, as recited in claims 7 and 23; and (3) a hydrogenation catalyst comprising at least one active metal, selected from the group consisting of the d-transition elements, each incorporated onto an inert support in an amount of from about 0.1 percent to about 20 percent by weight of the total catalyst, as recited in claim 20.

Argument

Claims 1-24 stand rejected under *35 U.S.C. § 103(a)* as being unpatentable over *Alexander* (6,024,865; hereinafter the '865 patent) in view of *Alexander* (6,059,962; hereinafter the '962 patent). The Examiner also rejected claims 17 & 18 under *35 U.S.C. § 112, second paragraph*, as having insufficient antecedent basis for the limitation "high-boiling." Appellants submit that the Examiner's rejections based on *35 U.S.C. §112, second paragraph* and *35 U.S.C. § 103(a)* are improper and should be reversed by this honorable board.

I. The rejection of Claims 17 and 18 under *35 U.S.C. § 112, second paragraph*

The Examiner rejected claims 17 & 18 under *35 U.S.C. § 112, second paragraph*, as having insufficient antecedent basis for the limitation "high-boiling." However, Appellants amended claims 17 and 18 in a document dated February 18, 2003 to have claims 17 and 18 depend from claim 11, which provides the necessary antecedent basis for the limitation "high-

boiling." As such, Appellants respectfully request that this honorable board reverse the Examiner's rejection of claims 17 and 18 based on *35 U.S.C. §112, second paragraph.*

II. The rejection of Claims 1-24 under *35 U.S.C. § 103(a)* as being unpatentable over the '865 patent in view of the '962 patent

To establish a *prima facie* case of obviousness three criteria must be met. First, there must be some suggestion or motivation to modify the cited reference or combine the cited references. *MPEP 2142.* Second, there must be a reasonable expectation of success. *Id.* Finally, the prior art reference or references when combined must teach or suggest all the elements of Appellant's claimed invention. *Id.* In meeting the foregoing criteria, it is essential that the prior art provide some motivation or suggestion to one of ordinary skill in the art to make Appellants' claimed invention. *In re Vaeck*, 947 F.3d 488, 493 (Fed. Cir. 1991). This teaching or suggestion to make the Appellant's claimed invention must be found in the prior art, not in Appellant's disclosure. *Id.* Considering this controlling law and the reasons set forth below, Appellants submit that the Examiner failed to establish a *prima facie* case of obviousness against claims 1-24.

A. The '865 patent in view of the '962 patent does not teach or suggest subjecting an alkylation product from an initial alkylation stage to a subsequent alkylation stage at temperatures at least 10° C. lower than the average of the elevated temperatures in the first alkylation stage, as recited in claims 1-24

Claim 1, which is representative of claims 1-24 for this point of contention, comprises the steps of: (1) in an initial contacting stage at elevated temperatures, contacting the feedstock with an acidic catalyst under conditions which are effective to convert a portion of the sulfur-containing organic compounds to a sulfur-containing material of higher molecular weight through alkylation by the olefins, thereby forming an initial product stream; and (2) in a subsequent contacting stage and at temperatures at least 10° C. lower than the average of the elevated temperatures in the first contacting stage, contacting at least a portion of the initial product stream with an acidic catalyst under conditions which are effective to convert a portion of the sulfur-containing organic compounds to a sulfur-containing material of higher molecular weight through alkylation by the olefins, thereby forming a subsequent product stream.

The '865 patent teaches a sulfur removal process comprising the steps of: (1) separating the feedstock by fractional distillation into a lower boiling fraction which contains the more volatile sulfur-containing aromatic impurities and at least one higher boiling fraction which

contains the less volatile sulfur-containing aromatic impurities; (2) separately subjecting the fractions to reaction conditions which are effective to convert at least a portion of its content of sulfur-containing aromatic impurities to higher boiling sulfur-containing products by alkylation with an alkylating agent in the presence of an acidic catalyst; and (3) removing the higher boiling sulfur containing products by fractional distillation. (*See Abstract of '865 patent*). The alkylation of the sulfur-containing aromatic impurities in the '865 patent is carried out through the parallel alkylation of feedstock fractions of different volatility. (*See Col. 6, lines 36-40*; *Figure 1*).

The '962 patent teaches a multiple stage sulfur removal process comprising the steps of: (1) subjecting a feedstock having sulfur-containing aromatic compounds to alkylation conditions which are effective to convert a portion of the impurities to higher boiling sulfur-containing products; (2) separating the resulting products by fractional distillation into a lower boiling fraction and a higher boiling fraction; (3) subjecting the higher boiling sulfur-containing fraction to alkylating conditions that are effective to convert at least a portion of its content of sulfur containing aromatic compounds to higher boiling sulfur-containing products; and (4) separating the resulting products by fractional distillation into a lower boiling fraction and a higher boiling fraction. The '962 patent teaches that alkylation of the sulfur-containing aromatic impurities in the '865 patent is conducted upon separate feedstock fractions of different volatility.

In the Office Action dated March 21, 2003 (hereinafter the "Office Action"), the Examiner conceded that the '865 patent "does not disclose a first contacting stage at elevated temperatures nor a second contacting stage at temperatures at least 10 C lower than an average of the elevated temperatures in the first contacting stage," as claimed by Appellants (See the Office Action at pg. 4). Despite this glaring deficiency in the cited references, the Examiner states that it would have been obvious to utilize a first contacting stage at elevated temperatures nor a second contacting stage at temperatures at least 10° C lower than an average of the elevated temperatures in the first contacting stage merely because the '865 patent discloses utilization of these stages under effective conditions. (See Office Action at pg. 6). Appellants respectfully submit that "utilization of these stages under effective conditions," as disclosed in the cited references, is insufficient to support a prima facie case of obviousness against claims 1-24 considering: (1) the disclosure of the '865 and '962 patents is contrary and/or counter-intuitive to Appellants claimed invention; and (2) the Examiner simply mischaracterizes the '865 patent.

For instance, the '865 and '962 patents teach that it is desirable to minimize the alkylation of aromatic hydrocarbons and the polymerization of olefins. (See the '865 patent at col. 8, lines 43-47; See the '962 patent at col. 9, lines 8-11). The '865 and '962 patents teach

that the sulfur-containing aromatic impurities often have a high reactivity and volatility relative to valuable aromatic hydrocarbons and olefins found in the same feedstream. (See the '865 patent at col. 8, lines 16-27; See the '962 patent at col. 8, lines 12-21). The inventions disclosed in the '865 and '962 patents take advantage of the typically higher reactivity of the more volatile sulfur-containing aromatic compounds. (See the '865 patent at col. 8 lines 39-42; See the '962 patent at col. 8, lines 29-31). Accordingly, the '865 and '962 patents intuitively suggest employing alkylation conditions which are less severe in the alkylation stage that in a secondary stage by the use of a lower temperature in the first stage as opposed to a higher temperature in a secondary stage, which is contrary to Appellants' claimed invention. (See the '865 patent at col. 8, lines 56-60; '962 patent at col. 8, lines 29-31 at col. 8, lines 45-50). In this regard, the '865 and '962 patents teach away from Appellants' claimed invention. At the very least, there is no motivation or suggestion in the '865 and the '962 patents to support a prima facie case of obviousness against claims 1-24.

Additionally, the Examiner mischaracterizes the '865 patent to support his position. More particularly, the Examiner states that the '865 patent discloses "a subsequent contacting stage contacting at least a portion of the initial product stream with an acidic catalyst under conditions which are effective to convert a portion of the impurities to sulfur-containing material of higher molecular weight through alkylation by olefins, thereby forming a subsequent product stream." (See Office Action at pg. 3).

Contrary to the Examiner's characterization of the '865 patent, the '865 patent does not disclose an initial contacting stage followed by a subsequent contacting stage as claimed by Appellants. The '865 patent discloses "[t]he alkylation of the sulfur-containing aromatic impurities in the practice of this invention is carried out through the parallel processing of feedstock fractions of different volatility. (Col. 6, lines 36-40) (See Figure 1). The feedstock is fractionated on the basis of boiling point to yield: (1) a fraction of lower boiling point which is comprised of volatile and typically highly reactive sulfur-containing aromatic impurities; and (2) at least one higher boiling fraction which contain less volatile and typically less reactive sulfur containing aromatic impurities. (Col. 6, lines 58-63). The staged alkylation of the invention is carried out by selectively alkylating the more volatile sulfur-containing aromatic impurities in one stage, while the less volatile sulfur-containing impurities are alkylated in at least one additional stage. (Col.7, lines 14-18). The alkylation stage which is used for the more volatile impurities is referred to herein as the first or initial stage, while the additional alkylation stage or stages are referred as second or secondary stages. (Col. 7, lines 20-23). Saying this, the '865 patent

cannot teach or suggest alkylation conditions in sequential contacting steps as claimed by Appellants because the '865 patent does not teach or suggest sequential contacting steps.

Therefore, in light of the foregoing, the Examiner failed to establish a prima facie case of obviousness against claims 1-24. Accordingly, Appellants respectfully request this honorable board to overturn the Examiner's rejection of claims 1-24 under *35 U.S.C. § 103(a)* as being unpatentable over the '865 patent in view of the '962 patent.

B. **In addition to the foregoing reasons, the '865 patent in view of the '962 patent do not teach or suggest an acidic catalyst of a subsequent contacting stage comprising a material which is prepared from an acidic catalyst by use in a first contacting stage, and a solid adsorbent comprising of a material which is prepared from the acidic catalyst by use in the first contacting stage and/or the subsequent contacting stage, as recited in claims 7 and 23**

Dependent claim 7, which is representative of claims 7 and 23, claims an acidic catalyst of a subsequent contacting stage comprising a material which is prepared from an acidic catalyst by use in a first contacting stage, and a solid adsorbent comprising of a material which is prepared from the acidic catalyst by use in the first contacting stage and/or the subsequent contacting stage. Appellants submit that that the '865 and '962 patents do not teach or suggest the elements recited in claims 7 and 23.

In the Office Action, the Examiner supported the rejection of claims 7 and 23 by asserting that the '865 patent discloses at column 13, lines 14-30 the elements recited in claims 7 and 23. (See Office Action at pg. 4). However, column 13, lines 14-30 of the '865 patent does not even remotely teach of suggests the elements recited in claims 7 and 23.

Column 13, lines 14-30 of the '865 patent discloses maintaining the catalytic activity of solid phosphoric acid deposited on kieselguhr by adding a small amount of alcohol to the feedstock (See '865 patent at col. 13, lines 14-30), not the elements recited in claims 7 and 23. In fact, the '865 and '962 patents in their entirety do not remotely mention: (1) an acidic catalyst of a subsequent contacting stage comprising a material which is prepared from an acidic catalyst by use in a first contacting stage; or (2) a solid adsorbent comprising of a material which is prepared from the acidic catalyst by use in the first contacting stage and/or the subsequent contacting stage, as recited in claims 7 and 23. As such, Appellants respectfully request this honorable board to overturn the Examiner's rejection of claims 7 and 23 under *35 U.S.C. § 103(a)* as being unpatentable over the '865 patent in view of the '962 patent for this additional reason.

C. In addition to the foregoing reasons, the '865 patent in view of the '962 patent do not teach or suggest a hydrogenation catalyst comprising at least one active metal, selected from the group consisting of the *d*-transition elements, each incorporated onto an inert support in an amount of from about 0.1 percent to about 20 percent by weight of the total catalyst, as recited in claims 20-24.

Dependent claim 20, which is representative of claims 20-24, claims a hydrogenation catalyst comprising at least one active metal, selected from the group consisting of the *d*-transition elements, each incorporated onto an inert support in an amount of from about 0.1 percent to about 20 percent by weight of the total catalyst. Appellants submit that that the '865 and '962 patents do not teach or suggest the limitations recited in claims 20-24. The Examiner even concedes that the cited references do not disclose the hydrogenation catalysts claimed in claims 20-24. (See Office Action at pg. 5). The Examiner, however, asserts that the particular catalysts claimed in claims 20-24 would have been obvious to one of ordinary skill in the art because the '865 patent merely "discloses the obtainment of low sulfur products through hydrotreatment in the presence of a catalyst." (See Office Action at pg. 8).

One of ordinary skill in the art would not find the disclosure of "a catalyst" in the '865 sufficient to teach or suggest the particular catalysts claimed in claims 20-24. To one of ordinary skill in the art, catalyst chemistry is very unpredictable due to many variables that come into play when creating a catalyst for a particular application. Indeed, those skilled in the art find catalysis so complex that it is "difficult to teach and write about with depth and coherence." (See *Gates, Katzer and Schuit*, "Chemistry of Catalytic Processes"; McGraw Hill 1979). Saying this, the disclosure of "a catalyst" lacks sufficient depth and coherence to teach or suggests the hydrogenation catalysts recited in claims 20-24. As such, Appellants respectfully request this honorable board to overturn the Examiner's rejection of claims 20-24 under *35 U.S.C. § 103(a)* as being unpatentable over the '865 patent in view of the '962 patent for this additional reason.

Conclusion

For the reasons stated above, Applicants respectfully submit that: (1) "high-boiling" in dependent claims 17 and 18 have the necessary antecedent basis in claim 11 from which they depend; and (2) a the cited references are insufficient to support a prima facie case of obviousness against Claims 1-24 of Applicants' invention. As such, Applicants submit that all claims now presented are in condition for allowance, and respectfully request this honorable

Board to reverse the rejection of claims 17 and 18 under *35 U.S.C. § 112* and the rejection of Claims 1-24 under *35 U.S.C. § 103(a)* over the '865 patent in view of the '962 patent.

Respectfully submitted,

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Appendix A

1. A process for the production of products which are liquid at ambient conditions and contain organic sulfur compounds of higher molecular weight than corresponding sulfur-containing compounds in the feedstock, which process comprises:

providing a feedstock comprising a mixture of hydrocarbons which includes olefins, and sulfur-containing organic compounds and nitrogen-containing organic compounds, the feedstock consisting essentially of material boiling between about 60° C. and about 345° C. and having a sulfur content up to about 4,000 or 5,000 parts per million and a nitrogen content up to about 2,000 parts per million;

passing the feedstock through a bed of solid adsorbent, under conditions suitable for adsorption within the bed, to effect selective adsorption and/or complexing of at least a portion of the contained nitrogen-containing organic compounds with the adsorbent, and thereby obtain effluent from the bed which contains less nitrogen-containing organic compounds than the feedstock;

in a first contacting stage at elevated temperatures, contacting the effluent with an acidic catalyst under conditions which are effective to convert a portion of the sulfur-containing organic compounds to a sulfur-containing material of higher molecular weight through alkylation by the olefins, thereby forming an initial product stream; and

in a subsequent contacting stage and at temperatures at least 10° C lower than the average of the elevated temperatures in the first contacting stage, contacting at least a portion of the initial product stream with an acidic catalyst under conditions which are effective to convert a portion of the sulfur-containing organic compounds to a sulfur-containing material of higher molecular weight through alkylation by the olefins, thereby forming a subsequent product stream.

2. The process of claim 1 wherein the feedstock is comprised of a naphtha from a catalytic cracking process and/or a thermal cracking process.

3. The process of claim 1 wherein the solid adsorbent is comprised of a material which is prepared from an acidic catalyst by use in at least one of the contacting stages.

4. The process of claim 1 wherein the olefin content of the feedstock is at least equal on a molar basis to that of the sulfur-containing organic compounds.

5. The process of claim 1 wherein solid phosphoric acid catalyst is used as the acidic catalyst in at least one of the contacting stages.

6. The process of claim 1 wherein the elevated temperatures used in the initial contacting stage are in a range from about 100° C to about 235° C.

7. The process of claim 1 wherein the acidic catalyst of the subsequent contacting stage is comprised of a material which is prepared from an acidic catalyst by use in the first contacting stage, and the solid adsorbent is comprised of a material which is prepared from the acidic catalyst by use in the first contacting stage and/or the subsequent contacting stage.

8. The process of claim 1 wherein the acidic catalyst is comprised of a solid phosphoric acid catalyst, and wherein the feedstock is comprised of a hydrating agent in an amount which exhibits a capability to enhance performance of the catalyst.

9. The process of claim 8 wherein the hydrating agent is at least one member of the group consisting of alkanols having from about 2 to about 5 carbon atoms.

10. The process of claim 8 wherein the temperatures in the subsequent contacting stage are at least 15° C lower than an average of the elevated temperatures in the initial contacting stage.

11. A process for the production of products which are liquid at ambient conditions and have a reduced content relative to the feedstock, which process comprises:

providing a feedstock comprising a mixture of hydrocarbons which includes olefins, nitrogen containing organic compounds and sulfur-containing organic compounds and nitrogen-containing organic compounds, the feedstock consisting essentially of material boiling between about 60° C. and about 345° C. and having a sulfur content up to about 4,000 or 5,000 parts per million;

passing the feedstock through a bed of solid adsorbent, under conditions suitable for adsorption within the bed, to effect selective adsorption and/or complexing of at least a portion of the contained nitrogen-containing organic compounds with the adsorbent, and thereby

obtain effluent from the bed which contains less nitrogen-containing organic compounds than the feedstock;

in a first contacting stage at elevated temperatures, contacting the effluent with an acidic catalyst under conditions which are effective to convert a portion of the sulfur-containing organic compounds to a sulfur-containing material of higher molecular weight through alkylation by the olefins, thereby forming an initial product stream;

in a subsequent contacting stage and at temperatures at least 10° C lower than the average of the elevated temperatures in the first contacting stage, contacting at least a portion of the initial product stream with an acidic catalyst under conditions which are effective to convert a portion of the sulfur-containing organic compounds to a sulfur-containing material of higher molecular weight through alkylation by the olefins, thereby forming a subsequent product stream; and

fractionating the subsequent product stream by distillation to provide at least one low boiling fraction consisting of a sulfur-lean, fraction having a sulfur content less than about 50 ppm, and a higher-boiling fraction consisting of a sulfur-rich, fraction containing the balance of the sulfur.

12. The process of claim 11 wherein the solid adsorbent is comprised of a material which is prepared from an acidic catalyst by use in at least one of the contacting stages.

13. The process of claim 11 wherein the olefin content of the feedstock is at least equal on a molar basis to that of the sulfur-containing organic compounds, and wherein the acidic catalyst of the subsequent contacting stage is comprised of a material which is prepared from an acidic catalyst by use in the first contacting stage, and the solid adsorbent is comprised of a material which is prepared from the acidic catalyst by use in the first contacting stage and/or the subsequent contacting stage.

14. The process of claim 11 wherein the elevated temperatures used in the initial contacting stage are in a range from about 100° C to about 235° C.

15. The process of claim 11 wherein the acidic catalyst in at least one of the contacting stages is a solid phosphoric acid catalyst, and wherein the feedstock is comprised of a hydrating agent in the an amount which exhibits a capability to enhance performance of the catalyst.

16. The process of claim 11 wherein the elevated temperatures used in the initial contacting stage are in a range from about 110° C to about 220° C, and wherein the temperatures used in the subsequent contacting stage is at least 30° C lower than an average of the elevated temperatures in the initial contacting stage.

17. The process of claim 11 wherein the one low-boiling fraction has a distillation end point and the high-boiling fraction has an initial boiling point such that the distillation end point and the initial boiling point are in the range from about 80° C to about 220° C.

18. The process of claim 11 wherein the high-boiling fraction has a distillation end point which is below about 249° C.

19. A process for the production of products which are liquid at ambient conditions and have a reduced content relative to the feedstock, which process comprises:

providing a feedstock comprising a mixture of hydrocarbons which includes olefins, nitrogen containing organic compounds and sulfur-containing organic compounds and nitrogen-containing organic compounds, the feedstock consisting essentially of material boiling between about 60° C. and about 345° C. and having a sulfur content up to about 4,000 or 5,000 parts per million;

passing the feedstock through a bed of solid adsorbent, under conditions suitable for adsorption within the bed, to effect selective adsorption and/or complexing of at least a portion of the contained nitrogen-containing organic compounds with the adsorbent, and thereby obtain effluent from the bed which contains less nitrogen-containing organic compounds than the feedstock;

in a first contacting stage at elevated temperatures, contacting the effluent with an acidic catalyst under conditions which are effective to convert a portion of the sulfur-containing organic compounds to a sulfur-containing material of higher molecular weight through alkylation by the olefins, thereby forming an initial product stream;

in a subsequent contacting stage and at temperatures at least 10° C lower than the average of the elevated temperatures in the first contacting stage, contacting at least a portion of the initial product stream with an acidic catalyst under conditions which are effective to convert a portion of the sulfur-containing organic compounds to a sulfur-containing material of

higher molecular weight through alkylation by the olefins, thereby forming a subsequent product stream;

fractionating the subsequent product stream by distillation to provide at least one low boiling fraction consisting of a sulfur-lean, fraction having a sulfur content less than about 50 ppm, and a higher-boiling fraction consisting of a sulfur-rich, mono-aromatic-lean fraction containing the balance of the sulfur;

treating the high-boiling fraction with a gaseous source of dihydrogen at hydrogenation conditions in the presence of a hydrogenation catalyst which exhibits a capability to enhance the incorporation of hydrogen into one or more of the sulfur-containing organic compounds and under conditions suitable for hydrogenation of one or more of the sulfur-containing organic compounds; and

recovering a high-boiling liquid having a sulfur content less than about 50 ppm.

20. The process according to claim 19 wherein the hydrogenation catalyst comprises at least one active metal, selected from the group consisting of the *d*-transition elements, each incorporated onto an inert support in an amount of from about 0.1 percent to about 20 percent by weight of the total catalyst.

21. The process according to claim 19 wherein the hydrogenation catalyst comprises one or more metals selected from the group consisting of cobalt, nickel, molybdenum and tungsten.

22. The process according to claim 19 wherein the olefin content of the feedstock is at least equal on a molar basis to that of the sulfur-containing organic compounds, and wherein the solid adsorbent is comprised of a material which is prepared from an acidic catalyst by use in at least one of the contacting stages.

23. The process according to claim 19 wherein the acidic catalyst of the subsequent contacting stage is comprised of a material which is prepared from an acidic catalyst by use in the first contacting stage, and the solid adsorbent is comprised of a material which is prepared from the acidic catalyst by use in the first contacting stage and/or the subsequent contacting stage.

24. The process according to claim 19 wherein the treating of the high-boiling fraction with a gaseous source of dihydrogen employs at least one bed of hydrogenation catalyst comprising nickel and one or more metals selected from the group consisting or, molybdenum and tungsten, each incorporated onto an inert support in an amount of from about 0.1 percent to about 20 percent by weight of the total catalyst.